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Learning from FAD response operations and exercises: Recommendations for USDA-APHIS

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Summary

The U.S. Department of Agriculture, Animal and Plant Health Inspection Service (USDA-APHIS) asked the CNA Corporation (CNAC) to synthesize lessons learned from recent exercises and real-world events involving foreign animal disease (FAD) outbreaks. We gathered and reviewed more than 60 after-action reports from FAD outbreaks and exercises that occurred in North America since 2002. We compared the lessons to identify their commonalities and differences, and then compiled our recommendations for next steps into this single summary report.

USDA-APHIS has an ongoing program for FAD preparedness and response and has demonstrated its ability to apply lessons learned from both exercises and real-world events. Our analysis shows that the basic problems documented in after-action reports from several years ago—such as having enough personnel with incident command training and knowing how other agencies can contribute to response efforts—have been largely addressed. Further, USDA-APHIS has worked on adapting the incident command system to fit the unique challenges of FAD response and is developing the Strategic Veterinary Stockpile to provide critical resources. At this point, more specific challenges remain.

One of the most apparent gaps in FAD preparedness efforts is the lack of information that USDA-APHIS provides to State and local governments about its own responsibilities and plans. Because of the critical role USDA-APHIS plays in developing FAD response policies, State and local jurisdictions need information on the actions USDA-APHIS is taking, the support resources it has, and the guidelines that must be followed. Our analysis also shows that State and local responders need to have key pieces of information that clarify their responsibilities. Without this information, State and local governments plan their FAD response activities in isolation and perhaps with incorrect expectations.

We identified three fundamental issues that, if addressed, would benefit Federal, State, and local efforts to improve FAD preparedness. These are as follows:

- USDA-APHIS should provide better guidance about its roles, resources, and processes to State and local governments, and provide easier access to existing FAD response plans and procedures.
- State and local governments need a training and planning support package for FAD response that better reflects the need for local and national agencies to work in tandem during these emergencies.
- Animal health agencies at all levels of government should make long-term investments to resolve technical issues that consistently arise in FAD response. The most pressing needs are:
  - — Identification of acceptable disposal methods by scale, species, product, geography, and climate.
  - — Resources and guidelines to facilitate response communications between the field/local command posts and high-level command centers.

In this report, we summarize the lessons learned across a range of FAD response areas. We also recommend steps that USDA-APHIS can take to further lead FAD preparedness efforts; ways that USDA-APHIS can provide better guidance to State and local governments; and steps that State and local animal health agencies can take to improve their own FAD response plans.

Approach and methodology

USDA-APHIS asked the CNA Corporation to synthesize lessons learned from recent exercises and real-world events involving foreign animal disease outbreaks. We sought after-action reports from FAD outbreaks and exercises that had occurred in North America since 2002, in order to examine lessons learned across multiple perspectives. We compared the lessons to identify their commonalities and differences, and then compiled our recommendations for next steps into this summary document.

In all, we gathered more than 60 after-action reports, ranging from two-hour county-level tabletop seminars, to multi-national command post exercises, to prolonged real-world FAD outbreaks. They included scenarios for the following diseases:

- Avian Influenza (AI)
- Bovine Spongiform Encephalopathy (BSE)
- Exotic Newcastle Disease (END)
- Foot and Mouth Disease (FMD)
- Monkeypox
- Rift Valley Fever (RVF)
- Rinderpest
- Several fictional FADs that were used in training exercises.

All of the FMD and RVF reports were from training exercises. All of the END reports were from the 2002-03 outbreak in the southwestern United States. Likewise, reports about monkeypox followed the U.S. outbreak in 2004. The BSE reports described responses to cases in both the United States and Canada. After-action reports regarding AI also included outbreaks in those two countries, and a number of exercises. Table 1 shows the numbers of reports for each FAD scenario.

Table 1. Breakdown of the after-action reports we reviewed for this study.[a]

Foreign Animal Disease (FAD)	Total # of reports	Real-world event	Exercise
Avian Influenza (AI)	19	X	X
Bovine Spongiform Encephalopathy (BSE)	4	X	
Exotic Newcastle Disease (END)	15	X	
Foot and Mouth Disease (FMD)	19		X
Monkeypox	3	X	
Rift Valley Fever (RVF)	2		X
Rinderpest	1		X
Fictional highly contagious diseases	3		X
Total	66		

a. This table includes the after-action reports listed in the bibliography as well as several documents describing personal communication and individual trip reports from real-world FAD outbreaks.

Since CNAC has analyzed response operations during a number of FAD exercises and events, we began by reviewing our own after-action reports. We then sought additional reports through the following sources:

- USDA-APHIS, Division of Veterinary Services
  - — Emergency Programs staff
  - — Area Emergency Coordinators
- Department of Defense (DOD)
  - — Veterinary Services Activity
  - — Northern Command
- Department of Homeland Security (DHS)
- State Veterinarians
- Canadian Food Inspection Agency (CFIA)
- North American Animal Health Committee, Emergency Management Working Group
- Contacts made at the U.S. Animal Health Association annual meeting.

We included multiple reports from the same event or exercise if they had separate authors or were written for different audiences. While we have gathered a large number of reports from a wide variety of agencies, we are unsure whether this is a representative sample of the full set of after-action reports that may exist. We know of many other reports that we were unable to review because they were either not provided to us or not yet completed at the time of this study.[1] Accordingly, our quantitative review of these lessons learned is necessarily limited.

A group of CNAC analysts reviewed the after-action reports and compared the lessons learned to assess their commonalities and differences. We created a database to track information about the exercises and events—such as the number of participants and whether the scenario involved terrorism—and to evaluate the recommendations stated in each report. To derive the lessons that were learned *across* the various scenarios, we defined a set of categories to provide a common basis for analysis. We reviewed the observations that fell under each category (e.g., command structure, laboratory response, training, etc.) and summarized the successful practices that were noted in the after-action reports, as well as the areas for improvement. We looked for themes across the categories, diseases, affected species, types of exercises or events, and levels of government.

The following section includes our recommendations for the next steps that USDA-APHIS can take on its own, for USDA-APHIS to assist State and local governments, and for State and local planners to be better prepared for an FAD outbreak. In the appendices that follow, we summarize the lessons learned for a range of FAD response areas. In an accompanying report, we provide recommendations for USDA-APHIS to develop a comprehensive exercise program that will address gaps and enhance training for FAD response [1].

1. We generally do not include citations for individual lessons learned in this report. This was a condition of our including some of the after-action reports in this study.

Conclusion and recommendations

After reviewing and analyzing the lessons learned from more than 60 after-action reports involving FAD outbreaks, we identified three fundamental issues that, if addressed, would benefit Federal, State, and local efforts to improve FAD preparedness. These are as follows:

- USDA-APHIS should provide better guidance about its roles, resources, and processes to State and local governments, and provide easier access to existing FAD response plans and procedures.
- State and local governments need a training and planning support package for FAD response that better reflects the requirements for local and national agencies to work in tandem during these emergencies.
- Animal health agencies at all levels of government should make long-term investments to resolve technical issues that consistently arise in FAD response. These most pressing needs are:
  - — Identification of acceptable disposal methods by scale, species, product, geography, and climate.
  - — Resources and guidelines to facilitate response communications between the field/local command posts and high-level command centers.

In the sections below, we separate our recommendations by whether they would be most effectively addressed by USDA-APHIS primarily, by USDA-APHIS assistance to State and local animal health agencies, or by State and local animal health agencies working on their own preparedness efforts. Reportedly, initiatives to address several of these recommendations are already underway. Just as we have seen a qualitative shift in lessons learned following FAD exercises and events from 2002 to 2005, we anticipate that another review conducted 3 to 5 years from now will document the benefits gained from current initiatives, challenges that remain, and new issues that arise.

Recommendations for USDA-APHIS to improve FAD preparedness

USDA-APHIS has an ongoing program for FAD preparedness and response and has demonstrated its ability to apply lessons learned from both exercises and real-world events. Our analysis shows that the basic problems documented in after-action reports from several years ago—such as obtaining incident command training and identifying other agencies that can contribute to response efforts—have been mostly addressed. For example, USDA-APHIS followed recommendations resulting from the 2002-03 outbreak of END to redefine some of its roles and responsibilities in FAD response. The new response structure was tested, and proved to be successful, in the recent BSE case investigation. Further, USDA-APHIS has worked on adapting the incident command system to fit the unique challenges of FAD response and is developing the Strategic Veterinary Stockpile to provide critical resources. To continue improving FAD response operations, particularly at the headquarters level, USDA-APHIS should consider the following recommendations.

Develop metrics or models to assess whether "sufficient" resources (both personnel and equipment) are available.

After-action reports frequently cited that more personnel and more equipment were needed, but they don't provide sufficient details to assess the quantities or specialties required, and how to procure those resources. USDA-APHIS, in collaboration with other Federal partners, should develop metrics to help responders better understand and articulate their needs (in a quantitative and actionable way), what resources are needed and in what quantities. In addition, USDA-APHIS should identify other Federal agencies that can provide some of the resources.

Develop a comprehensive set of standardized job descriptions and associated qualifications to fill positions during an FAD response.

Where possible, job descriptions should specify potential differences between responsibilities for emergency response operations and day-to-day responsibilities. Those differences may include reporting duties, pace of operations, and work/rest and rotation policies. USDA-APHIS should use the job descriptions to determine what resources can be

obtained from other sources within USDA and from other agencies. For example, several Incident Command System (ICS) positions can likely be filled with trained and qualified individuals from other areas of expertise; if so, it will enlarge the pool of available resources that can support animal health emergency response operations.

Provide and maintain a cadre of personnel to support ICS procedures during all responses.

Several reports documented the need to have experienced ICS personnel, including support personnel, available during response operations. As mentioned above, USDA-APHIS should identify personnel from other Federal agencies to support the response, and complement this group with a USDA-APHIS cadre of trained personnel available to support response operations at any time. USDA-APHIS may be able to take advantage of other opportunities for training by sending selected personnel on "ride along" assignments with established ICS teams from other agencies. Developing a national roster for emergency response operations would support this effort.

Establish interagency mechanisms to access and deploy personnel who are not covered under existing agreements and call-up plans.

Our analysis revealed several memoranda of understanding (MOUs) that USDA, State, and local partners should prepare in advance of an FAD outbreak. The suggestions provided in this report are not likely to be comprehensive; because of ever-changing circumstances there may never be a comprehensive list. Therefore, in addition to establishing relevant agreements in advance, USDA-APHIS should work with its administrative and legal experts to establish a system that can rapidly contract with and pay for personnel who are not already covered under MOUs.

Establish procedures for aggregating and sharing information across operations centers.

Since USDA-APHIS has the ultimate responsibility for notifying trading partners of the nation's FAD status, headquarters officials should take the lead to develop standard procedures for compiling data and information about the FAD response. This effort could include outbreak data, along with case definitions, and notifications of changing response conditions (e.g., disaster or emergency declarations, quarantine status).

Establish protocols for sharing proprietary and sensitive information during FAD responses.

During FAD responses, sensitive information can take many forms, such as business information (owner name and location), operational information (shipping methods and routes for supplies such as FMD vaccine), and other information (diagnostic test results). USDA-APHIS should take the lead to prepare protocols for responders to share such information during FAD responses. It is more difficult to control information flow in large-scale responses than in small-scale ones, such as the recent BSE case investigation. Nonetheless, confidential and sensitive information will need to be shared with responders at all levels of government and possibly with industry partners. Pre-established protocols, and non-disclosure agreements (if necessary) can support efforts to minimize the release of inappropriate information. This solution should incorporate technical means, such as the application of secure web chat rooms, to share information.

Establish a working group to identify the legal authority and prepare protocols for identifying, collecting, handling, and securing evidence from crime scenes that involve an FAD.

In both intentional and unintentional outbreaks, criminal investigations may be critical components of the response. In areas where animal health and law enforcement response efforts overlap, clear legal authority should be documented so that responders understand how to operate during an FAD response. In areas where those efforts conflict (e.g., disposing of carcasses as quickly as possible to reduce disease spread, or maintaining the carcasses as evidence for use in criminal proceedings), the working group should recommend ways to operate in the response, particularly when there are competing goals or tactical needs. [2]

2. In collaboration with the U.S. Department of Health and Human Services (HHS) and USDA, the Federal Bureau of Investigation (FBI) is hosting a joint training conference on criminal and terrorist incidents within the food and agriculture sector. This training will be held in late March 2006 and is designed to foster a greater understanding of roles and responsibilities in connection with a criminal or terrorist incident.

Develop specific national guidelines for a variety of disposal options.

USDA-APHIS should examine how CFIA has incorporated disposal guidelines into FAD response plans, since those plans proved useful and effective during the 2003 AI outbreak. USDA-APHIS should give the States guidance on acceptable practices and methods for disposal of both animal carcasses and products. Then State and local officials should work on agreements with other agencies and response partners on how to carry out those practices. Additional scientific, legal, and analytical research may be needed to understand the restrictions due to environmental regulations and to ascertain specific planning factors, such as how many square feet per carcass are needed for mass burial or how to inactivate FMD virus in milk prior to disposal.

Take the lead to determine criteria for resuming movement of animals and products during an FAD response.

Rapid resumption of movement, particularly for non-susceptible animals and products, can reduce the economic burden of a contagious FAD outbreak. However, we saw limited attention to this issue in the reports we reviewed, and considerable variation by disease. We recommend USDA-APHIS determine generic guidance, that can be quickly adopted to local conditions by local responders, for resuming movement of animals and animal products following FAD outbreaks, potentially through consultation with subject-matter experts or the initiation of research to address this issue.

Include disaster mental health experts in response planning and exercises.

USDA-APHIS should consider how to integrate disaster mental health services experts into response planning and exercises, and provide those experts with information about issues that are unique to FAD responses. Disaster mental health experts have strategies that can minimize the psychological consequences of disasters, and improve mental health outcomes over time. Such strategies need to be incorporated into the overall disease containment and stamp-out policies when outbreaks affect large populations or entire communities. During a federally declared emergency or disaster, crisis counseling grants may be provided through the Federal Emergency Management Agency (FEMA); however, a variety of Federal Departments and

agencies can provide grants as well as real-time consulting services. The Substance Abuse and Mental Health Services Administration (SAMHSA) within HHS maintains a disaster technical assistance center that can provide rapid response to requests. Documenting this resource in response plans is one way to quickly address this issue.

Expand the current process of reviewing Tripartite exercise reports and addressing the recommendations through action-items for decision-makers.

This practice has resulted in successful changes to the North American FMD Vaccine Bank program and has helped partner agencies better understand the issues involved in making decisions regarding FMD vaccine. Issues that arise in other exercises should also be incorporated in the design of future exercises so that various options can be tested and documented. This process has reportedly enhanced overall FMD preparedness since the original Tripartite 2000 exercise. In addition to Tripartite exercise reports, USDA-APHIS should seek to review State-level after-action reports from exercises and real-world events since these documents often include recommendations for Federal actions.

Recommendations for USDA-APHIS to provide better guidance to State and local governments

One of the most apparent gaps in USDA-APHIS's planning process is the lack of information it provides to State and local governments about its own responsibilities and plans. Because of the critical role USDA plays in developing policies, State and local jurisdictions need information on the role USDA-APHIS is taking, the resources it has for support of FAD responses, and the guidelines that must be followed (as well as those that are more flexible). Without this information, State and local governments plan their own FAD response activities in isolation. We found a range of expectations for USDA-APHIS. Some State and local partners expect the Federal government to handle nearly the entire operation. Others assume that county agencies will initially handle an FMD outbreak without any outside intervention (the National Response Plan might be interpreted to suggest this). In order to provide better guidance for State and local governments, USDA-APHIS should consider the following recommendations.

Prepare guidance documents for State and local governments that describe their role and authority in FAD response, as well as specific guidelines for the procedures and resources USDA-APHIS will apply.

Although the National Incident Management System (NIMS) assumes local commanders will have initial control of an emergency response, FADs have international trade implications and require an integrated local and national approach instead. USDA-APHIS should work more closely with State and local partners to provide education about Federal policies to quickly identify and resolve conflicts that might arise between Federal, State, and local priorities. This guidance should include information on procedures required to request Federal support (including financial) from both USDA and DHS, and the circumstances under which each process can be used.

Make response plans—and to the extent possible, operating procedures or templates for crafting them—easily accessible at the onset of an FAD response, or ideally, even before the response begins.

Responders in several real-world events and exercises were reluctant to develop new standard operating procedures (SOPs) when they knew, or strongly suspected that, similar guidelines were already available. Adapting previously-approved plans and SOPs would shorten their response time. However, there appears to be no single clearinghouse for these plans. Animal health officials typically use their own professional networks to get access to existing plans, and then hope that they've obtained the most recent versions. In addition, USDA-APHIS should institute a clear and rapid process for preparing and approving SOPs during a response. The documentation of processes used during the BSE and END responses can provide a starting point.

Provide States with a clear and concise overview of Federal stop-movement and quarantine authority and responsibilities.

Many of the challenges State and local governments reported were, in part, a result of incomplete understanding of the Federal government's roles, responsibilities, and legal authority during an FAD outbreak. The draft National Animal Health Emergency Management System (NAHEMS, 2003) guidelines contain detailed information about USDA's authorities, responsibilities, and possible

actions following an outbreak of a contagious FAD. The information is provided approximately one-third of the way through the 70-page draft, yet it is some of the most important information that State and local governments need in order to prepare for their own response. The USDA-APHIS Legislative and Public Affairs office should prepare a brief document to separately describe USDA's roles, responsibilities, legal authority, and jurisdictional limitations in imposing stop-movement restrictions. The document may be supplemented with in-depth information, such as additional details on the U.S. Federal codes.

Help State and local responders create plans that will allow them to integrate with the USDA-APHIS response.

In addition to understanding what USDA will do during an FAD response, the State and local responders need to know what USDA expects *from them* during a response. For example, what skills areas will they need to cover, what materials and equipment will they need to locate, and how many personnel does USDA expect them to provide? Additionally, some components of a response, such as the establishment of a single point of contact for the media, require clear coordination in planning. USDA-APHIS cannot assume that State and local response plans will be written in a manner consistent with its own policies and plans unless information on these issues is shared during the writing process.

Insist that USDA-APHIS be involved in DHS-sponsored exercises that have FAD scenarios.

We learned over the course of this review that a number of agriculture response exercises are conducted without the involvement of Federal animal health officials. Or, USDA representatives may be included for the conduct of the exercise (though not the planning), but then don't have access to the after-action report. Otherwise, the local responders are receiving FAD response training without having the full set of information available to them. The new Area Emergency Coordinator positions may provide an important avenue for USDA-APHIS to increase its visibility at local-level exercises.

Assist with the development of County and State Agriculture Response Teams (CARTs and SARTs) that are staffed by local personnel.

These teams provide already-trained human resources in the event of an FAD outbreak, mechanisms for calling them up, and sometimes dedicated equipment for those responders to use. They are also a good target audience for training on FAD and zoonotic disease response procedures. USDA-APHIS should help these teams understand their mission in the context of an integrated local and national emergency response. One way to accomplish this is by designing regional exercises that specifically include these teams.

Provide guidance to State and local governments on what contact information should be readily available.

The lessons learned showed a need for all levels of government to maintain contact information for potential responders and response partners. USDA-APHIS needs to provide a template of agencies to contact, and potential triggers that should cause them to be contacted. At minimum, information on contacts and trigger points for "when to call" should be available for public health, law enforcement, environmental regulators, public officials (e.g., agriculture commissioners, mayors, governors), and industry representatives.

Improve interagency relationships, communications, and planning efforts to respond to zoonotic diseases.

These requirements were validated by reports from the responses to outbreaks of AI and of monkeypox. USDA, DHS, and HHS should continue to provide incentives to States to improve the coordination between animal and human health response agencies, and, in turn, that States encourage local governments to continue to work together on FAD planning and response efforts. To the extent possible, this work should provide clear guidance on the distinctions between public and animal health roles and responsibilities in primarily agriculture outbreaks of zoonotic diseases. For example, in an outbreak of avian influenza the response efforts may be devoted to the eradication of disease in poultry, whereas in an outbreak of monkeypox it may be primarily a public health response operation.

Educate State animal health officials on the North American FMD Vaccine Bank and its activation protocols.

It was apparent in the after-action reports that many, if not most, State and local animal health officials make erroneous assumptions about the availability of FMD vaccine. While there are a number of technical and sensitive issues surrounding use of the North American FMD Vaccine Bank, at least State Veterinarians and State agriculture emergency directors should be aware of the mechanisms by which this resource is made available. Perhaps this information sharing between USDA-APHIS and State officials can be modeled after the current efforts to inform animal health officials about the National Veterinary Stockpile. USDA-APHIS should also continue to support the training of local- and State-level responders to exercise FMD vaccination plans. One goal of this training should be to identify those decisions that must be made at the National level before State officials can prepare their own plans for carrying out FMD vaccination.

Provide similar guidance for Tribal governments.

Collaboration with Indian Tribes was not mentioned in any of the exercise reports we reviewed, even though this need was evident in real-world FAD outbreaks. USDA-APHIS should encourage States to involve Tribes in their exercise plans. USDA-APHIS should also consider whether this issue might be better addressed through separate Federal funding, as the Tripartite exercises currently are.

Recommendations for State and local FAD response plans

An overarching theme in the lessons learned was that effective incident management requires individuals, teams, response leaders, and responding agencies to understand their roles and responsibilities. The reports suggest that State and local responders need to have key pieces of information that clarify those responsibilities. Several of our recommendations are related, and if put into place, should give these officials the information they need in order to plan for their roles in the broader context of FAD response. To improve their own response planning efforts, State and local governments should consider the following recommendations.

Identify populations and communities within the State that may have unique public information needs and develop FAD response strategies for reaching those populations.

Several after-action reports mentioned communities that are integral to production agriculture but are difficult to reach with traditional communications methods. Examples of these communities include non-English speakers, illegal immigrants, and Amish farmers. Plans for reaching these groups could state which languages, media, or public affairs efforts should be used, and give suggestions for finding points of contact, acquiring translation services, or addressing technology limitations. Federal responders may not be aware of the unique needs within each State.

Develop specific response plans/operating procedures for addressing local public information needs.

In addition to procedures for reaching special populations within each State, a list of other procedures and responsibilities for information sharing could be included in State and local response plans. These would include a list of external agencies and private individuals (such as licensed veterinarians) who might need to be notified in the event of an FAD outbreak, and an alternative means of communications that might be used to provide specific, detailed information to stakeholders. By identifying sources of readily accessible information on the FAD that can be distributed to the public, and preparing templates for releases, State and local officials could expedite the composition of public information documents. Local responders should consider the possibility that providing information to national media outlets will take precedence over providing local releases.

Prepare overviews of State and local stop-movement and quarantine authorities and responsibilities.

At the local and State levels, each jurisdiction should understand their existing legal authority with regard to quarantine, and know how to impose that authority in conjunction with higher ones (e.g., State and Federal authorities combined), as appropriate. Legal experts need to be consulted to determine the nuances of each authority, which will differ by State (or local) jurisdiction. The questions regarding authority to control human movement—through

quarantine or mandatory cleaning and disinfection procedures—should be included in the overviews of quarantine authority. USDA or DHS may consider providing incentives for States considered to be at high-risk for contagious FADs to examine these issues, possibly by encouraging States to examine them in seminars or exercises.

Incorporate stress management procedures into response plans.

Stress management services should be offered to the general population affected by an FAD outbreak. Also, incorporating stress management strategies into response planning early on can minimize long-term impacts on responders. One way to address this is by establishing work/rest rotation policies that specify the length of deployment to a response location, and the time to be allowed home between deployments, as well as work/rest policies while working on-site. FAD response can present unique challenges for maintaining the physical and mental health of local responders. Federal, State, and local mental health agencies should be invited to support these efforts.

Encourage industry partners to develop biosecurity plans, including cleaning and disinfection, for their own facilities.

The presence of industry response plans was cited as a reason for success in several real-world events. State and local animal health officials should continue working with industry partners first to develop their own plans, and then to understand how those plans would be activated and where they fit into the overall response effort. These plans should be incorporated into FAD training exercises.

Identify which disposal practices are acceptable according to the geography, resources, and environmental regulations of each state.

USDA guidelines should be coupled with specific plans for each state. At a minimum, plans for disposal practices should consider contingencies for different animal species and their potentially infected products, numbers and volume to be disposed of, environmental and seasonal concerns for selecting a disposal site, and preparatory disposal requirements. To the extent that disposal sites can be pre-identified and pre-arranged, doing so would notably speed up the time needed to carry out these operations during an event.

Work with public health officials to develop initial response procedures for potential zoonotic disease outbreaks.

These plans should include the triggers for reporting disease cases to the local and State public health and animal health offices. If a diagnosis is not available, the agreements should include what types of clinical signs, species affected, and mortality/morbidity rates warrant reporting a case to local and State officials. The collaborations needed to eradicate vector-borne diseases (such as with agencies responsible for pest management) should also be discussed.

Establish a role for a "lab liaison."

To facilitate more timely reporting and coordination with national testing laboratories, State and local planners should include a laboratory liaison in their response plans. This individual could ensure that regional/area/field personnel rapidly receive the test results, work with local/regional laboratories that are assisting with the response, and provide instructions to responders for the proper collection, handling, and transport of samples. This liaison could also receive and forward any pending laboratory results or other information after an Incident Command Post has closed.

Work with county-level officials to understand their technical limitations for communication via phone and internet, and then either adapt communications methods accordingly or find ways to improve the county-level capability.

This work may include assistance with purchasing wireless communications tools and training on how to use them for data collection during an FAD outbreak. The likely occurrence of FAD outbreaks in rural (vs. urban) areas can magnify any technology gap. State government officials can assist county agencies with obtaining Federal funding to address these technical gaps, which apply to all emergency response operations, not just FAD outbreaks. Technological interoperability between levels of government should also be a goal.

Seek guidance from USDA-APHIS during the development of State and local FAD response plans and incorporate procedures that have already been tested.

Through our review of after-action reports, it appears that some State and local governments did not seek the most useful sources of information when preparing their FAD response plans. As discussed throughout this paper, FAD response includes many issues that may not arise in other emergency operations. Examples of policies and procedures that were cited as unique to FAD response include:

- Collecting samples and specimens
- Tracking data, such as the identification of affected premises
- Updating definitions of what is an FAD "case"
- Obtaining funds and resources, since they may be provided by USDA and/or other Federal agencies.
- Setting limits for media personnel, such as prohibiting their access to farms, laboratories or EOCs.
- Establishing links between animal health and public health agencies.

State and local response planners should particularly seek guidance from USDA-APHIS on these issues. If the information isn't available, or isn't applicable beyond the Federal level of response, State and local planners should encourage USDA-APHIS to better address these planning needs. In addition, summarized copies of response plans should be made available to responders from other agencies.

Appendix A
Universal recommendations for preparedness

Several consistently mentioned "lessons" from the after-action reports are actually suggestions that apply to many of types of events, both simple and complex. We frequently find these statements in after-action reports regarding FAD outbreaks, public health events, and even military exercises. Most notably though, they also apply to any kind of group effort, even those that are not emergency response operations. A simple recommendation for "better training" or to "plan, plan, plan" is no more helpful to an FAD Incident Commander than it does to a football coach or a preschool teacher. Thus, we considered the following to be universal recommendations for preparedness:

- Improve training.
- Improve plans.
- Improve communications.

Mostly because they are so universal and general, these recommendations are likely to never be fully met. There is always the capacity to improve training, plans, or communications. Also, technology, personnel, and politics will change, constantly requiring further revisions to these areas of preparedness.

On the other hand, since these observations appear so frequently in the after-action reports, they do suggest where the best "bang for the buck" might be achieved to improve FAD response efforts. To that end, USDA-APHIS should invest in training, plans, and communications in order to adequately meet responders' needs. In later sections of this report, we describe some specific suggestions for training, plans, and communications that emerged from our review.

Along with these universal recommendations, a number of general observations were also evident in the lessons learned. These observations applied more specifically to emergency response and identified the needs to:

- Better understand the Incident Command System.
- Work more effectively with other response agencies.
- Provide more support for decision-makers.

These general response truths are critical for a variety of incidents, such as hurricanes or bomb scares. Again, investing in these areas may prove useful for USDA-APHIS, particularly since the agency will be called upon to respond to many threats—not just FAD outbreaks. Overall, these recommendations can be met by continued training and practice through exercises to expose more responders to the applications of ICS in emergency response.

Appendix B
Lessons learned about incident management

Successful incident management involves managing the available resources of various agencies to address the incident in an efficient and appropriate manner. In February 2003, the President of the United States issued Homeland Security Presidential Directive (HSPD)-5, which directed the U.S. government to establish "a single, comprehensive approach to domestic incident management." DHS administers the National Incident Management System (NIMS) and the National Response Plan (NRP). Together, these documents "provide the structure and mechanisms for national level policy and operational direction for Federal support to State and local incident managers and for exercising direct Federal authorities and responsibilities, as appropriate [2]." As a signatory to the NRP, USDA has committed to supporting the NRP and NIMS concepts, including those of the ICS, and higher-level management organizations described by the NIMS, such as the use of emergency operations centers, area commands, and various coordination groups to support Federal involvement in emergency response operations.

Responders in FAD outbreaks and exercises over the past few years have demonstrated varied levels of knowledge, understanding, and capabilities regarding the application of ICS to disease outbreaks. USDA-APHIS recently clarified the role of its National Coordination Group, which is responsible for response coordination as well as development and approval of new policies. This group does not maintain "line control" over individual Incident Command Posts (ICPs). This structure creates one of centralized command but decentralized control of response operations, and fits well with the U.S. model in which responses are managed primarily at the local level, followed by State and then Federal support.

Though most, if not all, State animal health agencies have been investing time and resources in learning to apply ICS and NIMS concepts, the after-action reports indicate that there is variability among the States' level of preparedness. Not surprisingly, those agencies that have recent (2002 or later) experience with responses to disease outbreaks, such as BSE, AI, and END, appear more advanced than those who are solely using simulations and exercises to develop and test their plans.

Reports from real-world events and exercises that involved local responders typically said that participants recognized the inherent value of the ICS system—even in situations when the event was the first exposure to ICS for most of the responders. For example, an after-action report from the monkeypox outbreak reported that ICS simplified the authority and accountability for decision-making during the local response. That report also noted that the event was the first exposure to ICS for several of the local agencies [3].

We found a few instances of exercises and events that documented examples of self-correcting operations. For example, during a State-level FMD exercise, responders re-organized the teams early in the exercise, and then tested out the new system in the remaining days [4]. In that same exercise, the response teams had difficulty effectively communicating with each other on day 1, but by day 2 they had developed an effective operational rhythm that included regular meetings and status reports. A report from another command post exercise documented improvement in direction and control throughout the exercise, as FAD responders came to better understand their roles in relation to the other agencies involved [5].

In general, and as might be expected, the after-action reports document that in the early stages of an FAD emergency, responders would benefit from understanding and applying the basic principles of ICS. For example, exercise reports often cited the need to improve basic command post functions such as tracking shift changes, developing turnover briefs, using information monitoring systems, and having additional administrative support. Reports also mentioned the need for standard operating procedures (SOPs) specific to an ICS section. Overall, we noted that as responders had more training and experience with ICS, the response challenges documented in after-action

reports became more specific. In the sections below, we present synopses of the lessons learned that concern the overall incident management of an FAD response.

Command structure and organization

In the ICS and the more recently developed unified command system, responders are divided into sections in order to delegate responsibility and authority. ICS sections typically include:

- Command leadership, led by the Incident Commander
- Operations
- Plans
- Logistics
- Administration and Finance.

Depending on the magnitude and location of the incident, multiple ICPs and area commands may be set up, and USDA and other Federal department headquarters may activate their own command centers. If a long-term planning element is needed, it may be established shortly after the response operations get underway.

The after-action reports documented the challenges to maintaining a common operational picture that arose when response teams made decisions—which they were authorized to make—in the absence of information from other response leaders. In other events, responders sought information directly from the source and bypassed the ICS chain of command. This can be particularly tempting for those whose daily responsibilities require reporting directly to the person with jurisdictional authority, such as the State Veterinarian. FAD response operations may set up additional layers of reporting, but ICP leaders need to know what the issues are and what the requests for new policies might be.

The conventional ICS needs to be adapted to FAD responses. For example, some tasks overlap both the planning and operations functions of an ICP (e.g., diagnosis, surveillance, and epidemiology). From organizational charts included in the after-action reports, we

found that the surveillance and analysis function has been placed in both the Operations and the Plans Sections. In one State-level FMD exercise, the epidemiology group was first set up as part of the Operations Section, but they quickly decided the Plans Section was a better fit for their responsibilities. Even so, the group recognized that some of the functions they were managing needed to remain in the Operations Section, although they did not address the specific split during the exercise [4].

While reports from the END response and at least two exercises demonstrated that most of these functions can reasonably fit into either the Plans or Operations Section, USDA-APHIS needs to provide guidance to the State and local communities on what specific functions should be housed in each ICP section. However, USDA-APHIS and the States should also remain somewhat flexible, and ensure that the Operations and Planning Sections maintain close coordination for these tasks.

In addition, and perhaps of critical importance to State and local response planners, the definitions of ICP roles and responsibilities should acknowledge the need to manage national and international policy in tandem with the local incident response. As was documented in the END outbreak, leaders at each level of the response (i.e., at the ICP, area command, regional offices, and USDA-APHIS headquarters) require clear guidance on what issues they can decide on independently, and what decisions require approval. USDA-APHIS has already implemented some of the lessons learned in defining the roles and responsibilities of headquarters-level response elements. For example, several reports from the END response documented an ongoing debate about the role of the National Response Management Team. USDA-APHIS has since renamed the group the National Coordinating Group and defined its role as a coordination and policy-making group, rather than a group responsible for command and control.

The roles and responsibilities of each agency also need to be defined. In real-world events and exercises, several reports documented situations in which no agency emerged as the leader for a particular response task. Such situations require agencies to work together in order to identify task leadership/ownership and resources that can

be used. It also may require that additional legislation or regulations be developed—preferably beforehand since these may be difficult to complete in the short time frame in which FADs must be eradicated.

Information sharing and communication

One consistently noted set of lessons learned was the difficulty of tracking, maintaining and recording information about premises and cases, and then sharing this information across operations centers. This was reported as especially challenging when there was no single or pre-established source of information, and when reporting frequencies were not synchronized across response nodes. This impaired the responders' ability to develop a common operational picture. The following steps were recommended to support preparation of more consistent and valid information across different operations centers:

- Establish a single source of outbreak data for use in composing official reports.
- Establish a single source of key information, such as case definitions, stop movement status, and declarations, and a procedure for changing that information,
- Operations centers should prepare their reports at similar intervals, so that the reports won't appear inconsistent due to some being outdated relative to the others.
- To the extent possible, operations centers should use ICS forms that are specifically tailored to FAD responses, and all centers should use the same forms.
- A single agency should be designated to report information to the public and to emergency responders working on the response. (This was considered a successful practice in the recent BSE case investigation, during which all media questions were referred to USDA offices.)

Several reports mentioned the limited utility of conference calls as a reliable and efficient mechanism for information sharing. However, the after-action reports suggest that conference calls are used more effectively in real-world events than in exercises. Several reports from

real-world events documented the value of the daily interagency conference call to make decisions—in particular, those decisions that must be implemented by on-site (typically local) responders. The reports also documented the value of conducting leadership meetings prior to larger, all-staff or all-agency, conference calls. This enabled leaders to gather information needed to make decisions and then announce those decisions to a larger and broader audience. One report also documented the value of having strategic leaders from Federal agencies remaining in regular contact, in order to update each agency on agency-specific strategic response issues, outside of the larger interagency meetings [6].

In contrast, conference calls were generally considered problematic during exercises. Some of the problems noted were too many participants, inappropriate participants, lack of an agenda, poor sound quality, unreliable transmission of numerical data, and lack of a means to track or record outcomes from the call. Suggestions for improvement that we collected from the after-action reports include: appoint a manager to set the agenda and record outcomes, distribute materials to participants beforehand (situation reports, outbreak statistics), limit industry participation to association representatives, and use conference calls for actual decision-making rather than just information sharing.

Based on our review, it appears that the problems involving conference calls are generally an exercise artifact. One possible explanation is that the limited time allowed for exercises does not give participants an opportunity to work out the operational rhythm for information sharing and decision-making. Exercises are often limited to a few days, or even less than one day, of operations, whereas real-world events are typically at least a month long. Communications challenges build during the first few days of most events, and ideally are worked out as the response progresses. As documented in one real-world event, "The initial...conference calls were difficult to manage, due to the large number of participants. However, the effectiveness of these conference calls improved as representatives for the various industry associations...producers and...owners were identified" [7]. If conference calls are problematic in the early days of the response but improve over time, those problems may not be documented in after-action reports, which are generally written after, or at least well into, an event.

Another possibility is that exercises rely on conference calls to provide participants with information that they would actually receive through other channels. When conference calls are used as exercise situation "drivers," it may encourage all participants to join the call. Another potential reason for the difficulties is that in exercises the calls do not have the same mix of people in attendance that a conference call in an actual event would. It may be possible to change some exercise methodologies to improve the use of conference calls. It may also be helpful to agree that there are problems with conference calls in exercises, and acknowledge that they are exercise artifacts, and not focus too much attention on them in the report.

Finally, reports documented issues related to translation services for multilingual audiences. One report recommended that USDA contract with translation service providers so that translators can be provided quickly for any FAD response.

Information security

Two types of information security issues arose in the after-action reports:

- Handling of sensitive and confidential information, such as producers' names, locations, and proprietary business data
- Sharing of information that is classified for reasons of national security.

The concerns about handling confidential information stem from a few exercises and two real-world events (the 2004 AI outbreak in British Columbia and the 2005 BSE response in Texas). Exercise reports have documented the need to provide a mechanism for sharing sensitive information in a secure manner. For example, there were concerns about disseminating diagnostic information or information specific to the North American FMD Vaccine Bank, such as the availability of antigens and the movement of vaccine shipments [8, 9].

Lessons learned from the CFIA's response efforts in British Columbia suggest that confidentiality concerns precluded the transfer of some information between the various stakeholders, and that integrated or

improved information security protocols were required to prevent the inappropriate release of confidential information [10]. During the Texas BSE response, responders took extra care to avoid disclosing identifying information about the producer [6]. USDA-APHIS needs to develop protocols for sharing and disseminating non-classified but sensitive or confidential information, and for using non-disclosure agreements. In large responses, it is possible that such protocols and agreements could ease concerns as additional responders are brought in to support the response. Such agreements and protocols might also speed the process by which agencies outside the primary animal health agencies, such as HHS and its State counterparts, can be brought up-to-speed on the response.

Several exercise reports brought up concerns about sharing information that is classified for reasons of national security. One salient issue is the need for mechanisms to share intelligence information with other government agencies and with private sector organizations such as hospitals and agricultural businesses. The MayDay exercise recommended that State Veterinarians and Area Veterinarians in Charge (AVICs) be provided with security clearances to ensure that USDA personnel at headquarters can discuss the full circumstances of the outbreak and response efforts (such as availability of FMD vaccine) with lead officials in the affected State [11]. We have recently learned that some USDA-APHIS Area Emergency Coordinators also have security clearances. With the growing potential for agroterrorism, USDA-APHIS needs a more aggressive program to ensure a sufficient number of animal health responders have security clearances.

Human resources

We also noted lessons learned regarding the roles of various individuals and response teams in FAD response and any recommendations for qualification of response personnel. A common theme in both exercises and real-world events was that responders were unclear of their role in the response efforts. This issue points to the need for clear definitions of roles and responsibilities, and perhaps even job descriptions and necessary qualifications.

Several reports documented issues or questions about whether the incident commander and the jurisdictional authority should be one

and the same person. The after-action reports suggest that it is important to separate the role of daily response management (e.g., incident commander) from the jurisdictional authority (e.g., State Veterinarians or AVIC). Leaders with jurisdictional authority are often called away from the response to handle press conferences or other important issues that take them away from direct response activities. During large response efforts that include an area command, an AVIC from an unaffected Area may be brought in, since he/she would have both ICS and supervisory training and could support the resident AVIC.

Several reports documented problems that were attributed to response leaders' lack of training and experience with ICS. Specific issues included leaders who exercised authority outside of their jurisdiction, or who did not understand how to delegate authority to others. Such challenges ultimately affect the daily functioning of a command post. Leaders in command posts—at each level of the response, including the ICP—should have specific ICS training before taking on such a role. Ideally, the training should include shadowing or working with a section lead or ICP commander in another event. Such shadowing experience may be available in other States' emergency responses, or in other applications of ICS, such as that of the Forest Service.

Another concern for training and education was the need for county leaders to be more familiar with national response plans and to define their role within the context of the broader response. Several exercise reports documented the success and challenges some local leaders had in determining their role. In one exercise, elected county agriculture officials specified their role as liaisons and as local subject matter experts who could support the ICP [4]. These elected officials typically know the rural communities—the people, the farms, and the businesses—and they know where and how to get information. They can continue to lead as local agricultural officials while directly supporting the ICP or other aspects of the response. In support of this, USDA-APHIS should provide local governments with appropriate materials and contact information to support local efforts.

The after-action reports contained numerous mentions of the roles of local veterinarians during an FAD response, and their related training needs. For example, private practitioners might be called

upon to assist with diagnosis, vaccination, or euthanasia of the animals and to collaborate with public health officials in the event of a zoonotic disease. A number of reports suggested that private practitioners should be included in local emergency planning efforts. In turn, those veterinarians need training on standard EOC and emergency response practices. Suggestions for this training ranged from providing orientation materials for those who might be federalized to assist USDA-APHIS responders, to involving them in local exercises. Other reports recommended that State officials develop call-up plans so they can quickly gain the assistance of veterinarians from within their own state and/or from neighboring states.

The after-action reports also mentioned that private practitioners may need liability coverage for emergency response activities. One animal health official noted concerns about whether all members of an FAD task force are equally covered in terms of authorizations, liability, vehicle and equipment use, and other insurance. Liability issues remain unsettled after several FAD outbreaks.

The reports also described specific staffing needs beyond the personnel for pre-defined ICP sections or response teams. Table 2 is a list of the specialized expertise that FAD responders thought would be helpful. Perhaps not all of these personnel are needed for each event, but the list is a place to start. Very few guidelines on the numbers of staff were included in the after-action reports, and it is likely these would depend on the situation.

Several reports documented the need to establish personnel qualification requirements, and corresponding training opportunities, for leaders at the Federal, State, and local levels of response. Personnel qualifications related to ICS experience as well as specialized expertise should be determined to establish standards for critical positions. This can also improve the communications between response nodes. While some of the reports documented problems that arose when individuals with different backgrounds worked together, others noted successes when personnel who were serving in the same ICS position, but in different locations, had similar expertise and training.

Table 2. List of specialized personnel to assist with FAD response, as suggested in after-action reports

Response node	Role	Can be provided by
In the field	Staff for decontamination sites	Fire service personnel Staff from commercial operations that are affected by the outbreak
	Staff for roadblocks around quarantined farms	Local law enforcement officers Dept. of Transportation personnel Vehicle inspectors National Guard troops Other military troops
	Medical care providers to monitor and treat heat- or stress-related casualties of field responders	Public health agencies
	Industry/company veterinarian to work with depopulation crews	Commercial farms affected by the event
	Livestock inspectors to work with euthanasia teams	
	Livestock appraisers	
	Bilingual responders	
At the ICP or EOC	Infection control specialists	Public health agencies
	Mental health counselors	Public health agencies
	Criminal investigators	Law enforcement agencies
	Liaisons with the local community	County Agriculture Commissioners Logisticians Interpreters to work with ethnic groups
	Translators for written documents	Contractors
	Administrative support staff, perhaps for each Section of the ICP	
	Finance and contracting specialists	
	Logistics liaisons to work with the Planning and Operations Sections	Local representatives
	EMRS specialists	
Other locations	Additional laboratory staff	
	Additional USDA-APHIS-VS headquarters staff	
	Long-term planners	

In order to identify and recruit qualified response personnel, several after-action reports suggested maintaining a roster of personnel to fill specific roles. Even if the roster is not used for the first round of deployment, it can help identify backup personnel. However, establishing such a system imposes its own requirements, such as maintaining up-to-date contact information. If USDA-APHIS moves forward with establishing a roster of personnel and qualifications, it would likely be helpful to gather additional lessons learned from Federal organizations, such as the National Disaster Medical System, that have experience with using such a system.

Establishing standard qualifications for response positions can also help identify which positions require scientific, veterinary, or technical expertise, and which can be filled by personnel with other backgrounds. Making such determinations can support all levels of government efforts to determine which positions can easily be staffed with outside personnel when resources are short. The after-action reports also documented that response teams were often unsure of their specific role in the response. To support a better understanding of team responsibilities, response plans should include mission statements and team responsibilities, so that individuals working in the system know where they fit into the response.

Material resources

Several after-action reports included very general recommendations about equipment and supplies, such as "Ensure that necessary resources are available." These observations bring up questions such as "How do we know which resources are necessary?" and "What steps can we take to ensure those resources are available?" Through reviewing this group of after-action reports, we've identified some observations that help answer those questions. Additional analysis is needed to devise measures and readiness assessments that can determine which resources are truly necessary to do the job and how to get them.

The after-action reports mentioned a few requirements for facilities, but they included few quantitative measures and depended on the context of each FAD event. Several reports mentioned a need to identify space for emergency operations (such as for regional or area

EOCs) and said that those spaces should meet minimum technological connectivity requirements before being approved. Other reports mentioned a need to identify storage sites for animal waste and disposal. Table 3 lists some of the equipment requirements that were mentioned in the after-action reports.

Table 3. List of equipment and supplies to assist with FAD response, as suggested in after-action reports

Suggested equipment and supplies to assist with FAD response
Machinery to handle burial for carcass disposal
Decontamination supplies for those machines
Cell-phone boosters or other means to expand phone and radio capacity
Veterinary medications, disinfectant and captive bolts for the initial phase of livestock depopulation
Panels and chutes for herding livestock
Large quantities of fuel for carcass incineration
Coolers for vaccination kits
Syringes, gloves, and protective clothing for carrying out vaccination

Many reports suggested developing a list of equipment and materials that would be needed during an FAD response. State and local officials need to identify suppliers or locations of resources, POCs to help obtain them, and any existing MOUs to share resources across jurisdictions. These efforts will be supplemented by the development of a National Veterinary Stockpile. In that case, local and State responders should be made aware of the types of equipment and materials that are included in the stockpile, how they can request and access those supplies, and any associated tracking requirements. Then, they can develop their own lists of suppliers for additional resources that might be specific to their location or local industry.

A number of lessons learned concerned having the means of sharing resources across Federal, State, and industry organizations. They included the needs for:

- Having mutual aid agreements in place at the county and State levels, and educating incident commanders about those agreements.
- Knowing which resources an agriculture agency already has available.

- Using the resources of the affected commercial operations as much as possible—for example, leasing their equipment for use in disposal, using workers as animal handlers and equipment operators, and enlisting the help of staff veterinarians.
- Developing a request and tracking system that reduces redundant requests and ensures that requestors know how to ask for the resources they need.

FAD response plans should also include methods of forecasting resource needs. These could be methods to identify personnel requirements as early as possible, and templates for response teams to outline the personnel and resources they will need for each assignment. Recovery plans and procedures should be updated to include events of long duration. The results of previous exercises and events can help forecast what resources may be needed and how to best use them.

Legal authorities

Legal challenges often arise in FAD response operations because authorities, regulations, and policies differ across response jurisdictions, and because the declaration process is complex. After-action reports consistently show that incident management is affected because responders are not familiar with the declaration process, the competing Federal, State, and local authorities, or the determination of financial responsibility. In our review, we found that three questions were repeatedly asked:

- What can be legally done, when and by whom? (This includes the question, Who pays for what?)
- What happens when Federal, State, and local laws don't agree?
- How can we change the legal framework to make it work better?

Several short documents, such as those used in the FAD Incident Modified Functional Exercise in Texas and Operation Aphtosa in California, functioned as "cheat sheets" on legal matters. They included the following:

- Information on what authorities impose what protective actions.
- Limitations of orders/authorities.

- Penalties for violations.
- Description of the legal actions that may be performed under a presumptive diagnosis and those that must wait until a case has been officially confirmed.
- Graphics showing the hierarchy of authorities and illustrating the levels at which various decisions must be made. (For example, in some States the authority lies with the State Veterinarian, whereas others have an agricultural commission or other decision-making body.)

Several reports cited the necessity of exercising within legal realities and encouraged consistent training about authorities and regulations for every level of responder. This information should be distilled to make it readily available and relevant for animal health responders, and then updated as laws change and develop.

Having clear knowledge of the relevant authorities was consistently important. The after-action reports documented the need to better understand the disaster declaration process, what to do when animal control laws provided insufficient regulation, and what to do when Federal preemption of State law applied. Responders often needed clarification of their State's ability to stop the movement of animals and of people—both its requisite authority and its enforcement ability.

According to the reports, coordination of Federal, State and local authorities is an ongoing, and not entirely clear, process. Many legal standards and potential conflicts remain untested by real-life response and exercise scenarios. Many State and local legal authorities are inconsistent, which can give rise to difficulties when many States are engaged in a response.

Some efforts may be taken proactively, such as:

- Getting to know the emergency declaration process and becoming familiar with basic legal authorities.
- Anticipating the conflict of laws and gaining relative knowledge of State agricultural policies. (Some States have very detailed policies, and others do not.)

- To the extent possible, predetermining who pays for what, and when, and anticipating funding measures, indemnification and other costs.
- Documenting legal developments and processes into usable, digestible extracts whenever possible.

Several reports proposed ways to tailor emergency responses and make them more utilitarian and efficient. The Operation Aphtosa report recommended allocating an "emergency fund" that could be designated for use during a presumptive diagnosis of an FAD. This could provide for the initial response operations and indemnity costs, and could allow the eradication efforts to begin as soon as possible.

A report from the 2002 AI response in Virginia suggested creating a gradation of response or level of emergency, so that it is not a binary decision to declare an emergency or not. This would allow for better use of the limitedly available State personnel, and allow for financial support without complete reallocation of resources. Some of these needs could be provided through MOUs with State agencies and other government bodies.

Response plans

Response plans are the backbone of incident management. They cover the strategy of the response, the responsibilities of agencies and individuals involved, and the overall command structure. They may leave the details to be formalized later, according to the intricacies of each event.

SOPs have more details than response plans. They spell out the detailed steps involved in performing a certain objective, such as depopulating a herd of cattle, collecting samples from an animal for disease testing, or conducting a field investigation of a suspicious farm. They are not as flexible as response plans, due to the need for all responders to be consistent in their actions. For example, when responders are depopulating livestock they may need to follow field-proven safety measures to prevent injury. They must collect laboratory samples in a standardized manner to ensure that the results are reproducible and will stand up to legal scrutiny. Also, they need to have uniformity in their actions when they are under the watchful eye of stakeholders and the media.

The after-action reports documented several effective practices for developing and maintaining response plans and SOPs. These included the following:

- Make response plans and, to the extent possible, SOPs (or templates for SOPs) easily accessible from the onset of a response. Ideally the plans would be available prior to an actual response.
- Establish a clear and rapid process for preparing and approving SOPs during a response.
- Have summaries of response plans available to responders from other agencies.

One common theme regarding response plans and SOPs was that more documents need to be made accessible to planners and response operators. The after-action reports noted that States and counties are developing their own response plans without access to, or much education about, Federal response plans. In addition, several reports noted that local responders were not working within the context of the State plan. Both of these issues leave open the possibility that local jurisdictions will not understand how to work with the State response structure, and that neither local nor State jurisdictions will understand how to work with the Federal response structure.

In addition, response plans, SOPs, and templates should be shared across jurisdictions. Several reports noted that response operations would have been more efficient if responders had access to previously used plans and SOPs, or at least the templates, before starting their response or writing a new plan. Some States and counties have developed excellent response plans, and it would be cost effective for other States to adapt these plans for their own use. USDA-APHIS needs to develop a secure resource to support the sharing of response plans.[3] A secure, moderated, forum for the posting, discussion, and exchange of response plans and ideas would be valuable for further plan development. When no relevant agriculture response plans

3. A conceptually similar website was developed by the SAMHSA Disaster Technical Assistance Center (DTAC). This resource is available at http://www.mentalhealth.samhsa.gov/dtac/plans.asp

exist, it may be useful to reach out to other agencies with similar response operations. For example, participants in two FMD exercises used response plans for the Strategic National Stockpile in order to develop their own plans to distribute FMD vaccine.

SOPs are generally more detailed than response plans, and must be tailored to each specific response. In addition, they can contain response-sensitive information that may not be appropriate to share with a large audience. One report suggested storing SOPs on a secure section of the Emergency Management Response System (EMRS). A clear process for modifying response plans and SOPs during an event should be outlined, and then included in FAD response exercises.

The lessons learned also documented the need for specific processes and job aides to be standard response plan components. Table 4 lists potential items to be included in FAD response plans.

Table 4. List of items that should be included in FAD response plans, as suggested in after-action reports

Suggested items to include in FAD response plans
Activity checklists
Tracking forms to support continuity across shifts
Tickler/summary lists and response plan summaries
Stakeholder lists
Staffing call-down lists
Outside agency contact lists including other levels of government and agencies with other areas of expertise (e.g., public health, law enforcement, environmental protection)
Industry contact information
Mission statements for the organization and any teams mentioned in the plan
Data management procedures
Personnel rosters
Equipment lists

Trade concerns during an FAD incident require that local responses be conducted with an understanding of the national implications of the response. Therefore, it is critical that USDA-APHIS clearly state the national strategy and associated response goals early in the

response. This provides specific guidance for State and local responders to follow in planning and executing the response. If no response plans or strategic goals already exist (e.g., in cases involving new or emerging diseases) documenting USDA-APHIS goals and strategies early on will set the foundation for a successful response. State and local governments can then set their own goals and strategies that are clearly linked to national efforts.

Appendix C
Lessons learned about collaboration with response partners

Effective response management requires multiple organizations, often across the different levels of government and private sector, to work together to meet response objectives. A recurring theme in the after-action reports was the importance of having the right people from the right agencies involved during emergency preparedness planning and exercises. Several exercises and at least one real-world event documented that it can be unclear who is in charge, or who is in charge of what aspects of the response. It is important to note that many of the after-action reports were written before release of the NRP in April 2005. The NRP is intended to include animal disease outbreaks, which the previous Federal Response Plan did not, though the agriculture and food incident annex to the NRP is only a draft.

Although agroterrorism events and zoonotic disease scenarios tend to highlight the conflicts in multi-agency responses, interagency coordination issues arise in almost all FAD incidents. Interagency coordination can involve interactions at the same level but across domains of expertise and authorities: for example, USDA headquarters may interact with HHS headquarters, or State agriculture agencies may coordinate with State health and law enforcement agencies. It can also involve interactions between levels of government: USDA may communicate with State departments of agriculture, and States may communicate with local response organizations, and so on. Or, it can involve interactions between agencies that are at different levels and have different domains—for example, if USDA needs to share information with State departments of health. This last form of interagency coordination was cited as particularly challenging.

Several after-action reports, including those from the BSE and monkeypox responses, mentioned the need for departments at the Federal and State levels to conduct joint, rather than separate and independent, investigations during an outbreak. In some cases, different agencies required similar data, suggesting that dual efforts were redundant and potentially an inefficient use of resources. In addition, joint investigations reduce the number of visits to individuals and businesses. Also, when animal health and public health (or law enforcement) personnel conduct joint investigations, some of the questions, such as where to send information from investigative interviews, may be quickly resolved. In general, areas where the data required by different agencies can be collected at the same time should be identified. This should include what specific types of data are multi-use, and how agencies can share information so that each gains the data it needs but redundant efforts are avoided.

Other lessons regarding interagency coordination included the needs for:

- Interacting with industry representatives, and integrating them into the planning and response effort. Each level of government has its own industry relationships that need to be included in the response. Several reports from real-world events documented that effective coordination between government officials, industry leaders, and managers of affected premises was one reason that the response was successful.
- Identifying trigger points to notify other agencies, such as law enforcement or public health.
- Clarifying the biosecurity roles of public health and animal health agencies in zoonotic disease outbreaks.
- Including Liaison Officers in the ICP structure to provide agencies and industry groups with a single point of contact regarding the local response operations.
- Having a Site Coordinator serve as a single point of contact at each affected premises. This gives response teams a check-in point as they arrive on site, and gives officials a link to use for consistent dialogue with the premises owner.

Coordination between levels of government was also cited as a challenge in the after-action reports. State and local agencies often lacked the basic information they needed on what the Federal agencies plan to do in the event of a major FAD outbreak. This hindered not only their ability to plan, but also the coordination across levels of government. Further, if State and local agencies have incorrect assumptions, they will plan and train ineffectively.

States officials need specific information on how requests for aid should be handled when a USDA or a FEMA (i.e., a Presidential) declaration is tied to an animal health emergency. They need to know what procedures to use and have the tools to make the appropriate requests. Further analysis is needed to determine how the process works if there are simultaneous declarations from USDA and FEMA.

In turn, State and local governments need more information on how to obtain funding during disasters, as well as how to transfer contracts across levels of government when a higher authority takes over particular responsibilities. Local agencies require more detailed information on what resources are available from State and Federal governments to support their planning efforts. In the sections below, we summarize the lessons learned that concern collaboration with response partners during an FAD response.

Public health agencies

USDA and HHS frequently work together for issues related to the food supply and for FAD incidents involving both human and animal health (e.g., BSE or monkeypox). State-level animal health and public health agencies are often, but not always, organized to correspond to the Federal organizations. In general, the lessons learned emphasized the importance of building relationships between these animal health and public health agencies. Nearly half of the lessons learned relating to public health issues were general comments on the value of improving communications and collaboration between these groups of responders.

Other lessons learned were more specific. For example, CFIA officials documented the need to clarify the respective biosecurity responsibilities of the CFIA and public health authorities in response to zoonotic

disease outbreaks. Responders to the Delaware AI outbreak suggested having a single point of contact for human health issues, and recommended that this individual be responsible for regular communications with the local public health department. Another report suggested that public health agencies should be prepared to affirm that certain FADs, such as FMD, do not affect human health. Continued collaboration through exercises, as well as specific plans to meet public health agency requirements during an FAD outbreak, will assist further integration of these response efforts.

Law enforcement agencies

Most of the events that addressed law enforcement needs focused on local or State-level responses. Security issues related to accidental FAD outbreaks seem to be well known in the animal health emergency response community, but not in the law enforcement community. However, both communities were unsure about the combined application of animal health and law enforcement procedures in responses to agroterrorism events.

Although few successful practices were specifically mentioned, the reports provide some insights into practices that can enhance law enforcement efforts in FAD response planning. One reported suggested including representatives from a variety of law enforcement agencies in agriculture emergency response planning and exercises. They should be trained to respond to both accidental and intentional outbreaks, because in both cases the premises may be treated as a possible crime scene. Another suggested that law enforcement personnel work with members of the agriculture industry to help them understand early warning signs, develop proactive measures, and identify information sources who would report suspicious activity and potential criminal activity [12].

Several exercise reports documented questions from responders regarding evidence collection during an intentional FAD outbreak. Recommendations included reviewing protocols and policies for preserving evidence (including laboratory samples) and providing training to both animal health and law enforcement responders for the identification, handling, and security of evidence when an FAD outbreak response also becomes a criminal investigation.

Collectively, the after-action reports suggested there are insufficient resources at the county and State levels to enforce stop-movement and quarantine orders. Lessons learned focused on the number of available law enforcement personnel and their lack of training for FAD response. It is possible that the reported lack of enforcement personnel is at least in part an exercise artificiality. The reports documented growing, but still limited, participation from State law enforcement agencies, the Governor's office, and the State Emergency Management Agency. These resources are crucial to drafting realistic plans to enforce stop-movement and quarantine orders, and in understanding the depth of support available in an FAD response.

None of the after-action reports included calculations for the number of law enforcement personnel needed to support an FAD outbreak, and only a few documented the specific departments and agencies from which these personnel may be recruited. Of particular note is the lack of attention to the resources that industry partners can provide towards security. The agricultural industry as a whole will likely support stop-movement and quarantine orders in support of their economic interests, and use their own resources and staff to do so.

Mental health service providers

Mental health support to affected agriculture communities is rarely addressed directly in exercises or discussed in after-action reports from real-world events in North America, although some exercises have documented the lack of attention to it. The reports we reviewed for this project do not document any specific practices to provide adequate mental health services to communities affected by FAD outbreaks. In its commitment to comprehensively supporting the agricultural sector, USDA-APHIS should be concerned about the potential impact of mental health issues and take steps to protect the agricultural communities in the United States.

Reports from the United Kingdom's FMD outbreak in 2001 have documented significant mental health consequences in rural communities [13]. Initial assessments showed that in the first year, the FMD outbreak caused negative health and social consequences and human suffering, including loss of control over the basic routines of life;

anger and frustration at the way the crisis was handled; loss of confidence and self-esteem; damage to social networks; and signs of post-traumatic stress disorder and other mental health indicators [14]. This same research found that psychological challenges associated with anniversaries of culls and other traumas affected the recovery period. Deaville and colleagues showed that the numbers of affected individuals who used mental health services provided by the Rural Recovery Plan were larger than the numbers of those who had sought assistance prior to plan implementation [15].

These findings support the practice of providing disaster mental health assistance early in a potentially catastrophic FAD outbreak, and for a significant length of time following. Six reports mentioned lessons learned regarding mental health, although none documented existing practices to support the provision of such services. Overall, the lessons learned noted that participants were unsure how to provide mental health services, even though they felt it necessary to be proactive in offering mental health support. A related concern was the need to develop stress management plans for incident responders, producers, and livestock owners. The lessons are directly relevant to USDA-APHIS's mission to make "every effort to address the needs of all those involved in the U.S. agricultural sector" [16].

Industry groups

Lessons for working with industry partners arose in real-world events involving AI, END, and BSE, and in exercises involving FMD and Rinderpest. Industry involvement during response to an FAD outbreak was consistently regarded as successful. Pre-existing industry response plans were mentioned as "reasons for success" in several after-action reports. Other best practices for collaboration among government and industry officials included:

- Cooperation of commercial and non-commercial operation managers and owners in surveillance testing.
- Aggressive response of the local commercial industry in surveillance testing in all of their farms.

- Risk management decisions that were supported by industry officials.
- Co-location of industry representatives in the Emergency Operations Center.
- External communications that included regular meetings with partners from industry and public organizations.

Several reports also noted the variety and amount of resources that are available to local jurisdictions from the private sector. To further meet the demand for assistance, industry partners should have their own plans for cleaning and disinfecting their facilities, for training their personnel on biosecurity measures, and for reporting suspicious activity that might lead to a disease outbreak.

In turn, the reports noted that government agencies can improve their cooperation with industry by:

- Better anticipating the information requirements of industry partners and stakeholders.
- Supporting industry's development of biosecurity programs.
- Developing relationships with key brokers who can link an FAD Task Force to industries across a spectrum of commercial activities.
- Paying attention to local communities who are stakeholders in the disease eradication, as well as to commercial industry groups.
- Using already-established communication channels, such as Agriculture Extension Services.

One report noted that stakeholders had only a limited understanding of the relevant government response plans. Another report recommended developing of an interagency working group, including representatives from both government and the private sector organizations, to define the procedures that can or should be taken while awaiting confirmation of an FAD diagnosis. Such procedures could involve school traffic, postal routes, feed and rendering services, and any other required business service within the suspected areas. Reports also identified a need to improve the available information that can be provided to owners of confirmed infected premises.

Indian tribes

Tribal issues and concerns were mentioned only in after-action reports from the 2002-03 END outbreak. This outbreak included birds on the Colorado River Indian Tribes reservation. Federal responders worked with Tribal officials to eradicate the disease there. Several recommendations arose from this collaboration, including the following:

- Ensure consistency between Federal, State, and Tribal response plans and support authorities.
- Continue to keep Tribal officials informed and prepared for FAD response operations, particularly because State officials may not have full authority on Tribal lands, and many Tribal officials serve in leadership roles for short terms. A plan to respond to various infectious animal diseases should be developed with each reservation.
- Develop awareness of the material differences between the authority of States, Federal agencies, and Tribal reservations.

It is interesting to note that none of the exercise reports we reviewed included lessons learned for collaborating with Tribal officials. This indicates a gap that should be addressed in future exercises, especially since the recent history of FAD outbreaks has indicated a need to better understand Tribal concerns.

International coordination

The Tripartite series of exercises (Tripartite 2000, Amistad, MayDay, and Equinox) was designed to focus on cross-border communication between the United States, Canada, and Mexico. Reports from real-world events occurring near the U.S.-Canada border (the 2003 BSE response and the 2004 AI outbreak) also highlighted the need for different countries to coordinate their response activities. Lessons learned from other real-world events (the 2002-03 END outbreak and an AI outbreak in Delaware) showed that responders developed a better understanding of how response activities undertaken at the local level can have trade implications. In addition, an exercise sponsored by U.S. Northern Command considered the United States' capabilities to share resources with other countries.

Mostly, these lessons regarding international and trade concerns fell into four groups, which included the needs for animal health officials in North America to:

- Work together to conduct cross-border operations in an outbreak that affects more than one country.
- Have protocols for international communications at both the strategic and operational levels, and identifying the appropriate cross-border counterparts with whom to share information.
- Understand the differences between Federal and State/Provincial authorities in each country.
- Realize that field-level decisions regarding response areas such as disposal, surveillance, and case reporting can have implications for international relations and trade.

The Tripartite exercise series has provided an opportunity for animal health officials in multiple countries to work together on issues of common interest. We did not receive reports from any other exercises that involved representatives of more than one country. This suggests that the Tripartite series continues to serve unique coordination needs that are not otherwise exercised or trained to.

In addition to the Tripartite exercises, several recent FAD outbreaks have highlighted trade considerations that play an important role in determining local response actions such as "stamping out", vaccination, and disposal. For example, one report cautioned against using industry personnel to collect samples since having government personnel do so would raise the confidence of trading partners.

Though previous Tripartite exercises have examined international communication at the local and Federal headquarters levels, finding the right match-up for regional-level communication still proves elusive. In both Canada and Mexico, the immediate responsibility for FAD response lies with a central federal authority. This contrasts with the more decentralized U.S. political system, in which the initial response to an FAD outbreak begins locally. Thus, officials who appear to have similar positions in the response management hierarchy of a different country can have a very different scope of command authority.

Officials from the Tripartite countries had different approaches to response and disease control strategies for an FAD outbreak. During the Amistad exercise, Mexican officials were able to decide upon and enact federal policy more quickly than their U.S. counterparts. During the Equinox exercise, Canadian participants tended to view international coordination and communication of technical information as a national-level problem. In contrast, their U.S. counterparts tended to view this coordination as a sub-federal "area"-level issue.

Other unresolved issues from the Tripartite exercise series include reconciling the differences in depopulation and surveillance zones, a joint approach for deciding the fate of vaccinated animals, and using regionalization to zone an FMD-infected area in one country or in a region that crosses an international border. For each of these issues, exercise participants felt that coordination between officials in the United States, Canada, and Mexico was necessary.

Cooperative agreements and memoranda of understanding

Several reports noted the need to set up cooperative agreements or MOUs with outside agencies, in order to ensure access to resources during an incident. Table 5 presents information on such agreements that was noted in the after-action reports, including the jurisdiction that needed the agreement, the jurisdictions with which they wanted the agreement, and the reason for it. We do not consider this list comprehensive, but it may provide a starting point for planners who are considering what MOUs they need to establish for FAD response.

Table 5. List of MOUs to assist with FAD response, as noted in after-action reports

Jurisdiction in need	Agreement with	Type of support needed
State animal health agencies	USDA division such as APHIS, Forest Service, Wildlife Services, etc.	General request for additional resources
	State public health agencies	Additional resources for response to zoonotic disease outbreaks
	Other State agencies	Generic cooperative agreement for infectious diseases
State animal health agencies and USDA	Needs to be determined: none specifically mentioned.	Resources to increase available options for carcass disposal
Other State agencies	Federal agencies they regularly work with	Cooperative agreements that allow State and Federal agencies to work together on an FAD incident, rather than limiting cooperation to traditional incidents.
Other State agencies	Universities	Scientific expertise and other resources to support responders
APHIS and U.S. Forest Service	Bureau of Land Management	Sharing of facilities during response operations
USDA (or CFIA)	HHS (or Health Canada)	Additional resources for response to zoonotic disease outbreaks
USDA and CFIA	Tripartite partners	Sharing of outbreak data during an incident that spreads across international borders

Appendix D
Lessons learned about implementation of disease control strategies

This section of our report covers a variety of technical areas. Several of the topics, such as euthanasia, disposal, and FMD vaccination, are included in the NAHEMS guidelines that were developed by USDA-APHIS. NAHEMS is an integrated system for dealing with animal health incidents in the United States, including FADs [17]. These guidelines are designed for use by official response personnel in the event of a major animal health emergency and they provide information that may be used in the response plans of other Federal, State, and local agencies. The lessons learned described below may assist USDA-APHIS with updating the NAHEMS guidelines and improving their usefulness for animal health responders.

These lessons learned have cross-cutting themes. For example, officials working to develop and exercise operational plans in euthanasia, disposal, and FMD vaccination require additional scientific information to develop policies. The need for additional resources—both in terms of expert and experienced personnel and for specialized equipment—was also commonly cited in reports from exercises and real-world events, as was the need to streamline procedures to more rapidly provide information to field-level responders. These issues tended to be jurisdiction-neutral, in the sense that the lack of information, resources, and technology could affect any response. Nonetheless, USDA-APHIS is likely to take the lead in dealing with these issues as they arise. It is important to note that these issues are, at least in part, being addressed in USDA-APHIS' implementation of recommendations from the Animal Health Safeguarding Review's recommendations [18].

In the sections below, we summarize the lessons learned about NAHEMS guidelines and/or implementation of disease control strategies.

Appraisal and compensation

Lessons learned about appraisal and compensation arose in after-action reports from five FMD exercises. These exercises revealed persistent policy and procedural issues and the need for a systematic approach to appraisal. Questions that arose in exercises were: whether certain animals would be compensated for, how to appraise highly-valuable animals, and what is the source compensation funds. Reports from real-world events (AI and END outbreaks) included recommendations for States to have their own indemnity funds in order to get a quick start on response operations.

Other lessons learned regarding appraisal and compensation focused on needs for:

- Identifying the actual owners of the livestock, who may not be the same as the owners of the infected premises.
- Determining whether, or how, to compensate for land used during depopulation, disposal, and disinfection, and what the claims process should be.
- Analyzing the use of different appraisal categories, and the economic and operational trade-offs of treating animals individually or in groups, by breed, by production, or by age, and how various commodities should be handled in conjunction with that appraisal.
- Developing templates and standard forms that could reduce the amount of time needed to begin, and to approve, the appraisal of animals during an outbreak.
- Deciding how affiliated industries will be compensated.

These concerns seem more relevant to appraisal and compensation for cattle or swine, or the land used to dispose of those carcasses, than for birds. In recent avian disease outbreaks, the birds were disposed of in landfills; thus the issue of providing compensation for loss of land value was not a concern. Also, commercial poultry is usually appraised in groups, whereas cattle and swine have a larger range of productions values and would need separate appraisal methods.

Along with the practices used during avian disease outbreaks, lessons learned from FMD exercises should be used to revise appraisal and compensation guidelines.

Biosecurity

Responders questioned what operational practices and environments are especially risky for furthering disease spread, such as the transport of dead animals from the farm to rendering facilities or disposal sites, and for vehicle movements in an infected area. Lessons learned regarding biosecurity identified the needs for:

- Protocols to prevent the spread of an FAD during transport of live or dead animals, or of animal products such as milk or eggs.
- Protocols for how to handle materials that may need to be moved to/from an infected site, such as paper documents, vaccination kits, and cell phones.
- Training for all personnel who might come into contact with infected animals, materials, premises, or samples.
- Rapid acquisition of personal protective equipment for all those personnel.
- Industry involvement in developing biosecurity protocols.

Several reports noted that preventing contact with susceptible wildlife may require extraordinary biosecurity precautions. Some of these areas will require additional research before new guidelines can be developed—for example, the risk that milk movements will spread FMD. Another topic for further study is clarification of the respective biosecurity guidelines of animal health and public health agencies.

Biosecurity issues also included personal safety and employee health. Personal safety concerns arose during the Amistad Exercise and the END outbreak, in which the enforcement of movement restrictions with potentially non-compliant populations led responders to request law enforcement escorts as they visited premises in the quarantined zones. Lessons learned regarding employee health arose during AI and monkeypox outbreaks, such as a recommendation to have a health clinic for each Task Force.

Cleaning and disinfection

Most of the lessons learned regarding cleaning and disinfection (C&D) described the needs for:

- Interagency coordination regarding C&D policies, such as with the Food and Drug Administration and the Environmental Protection Agency.
- Guidelines for disinfection of animal products (such as milk or eggs) in lieu of, or prior to, disposal of those products.
- Guidelines and resources for C&D of vehicles, including vehicle decontamination stations.
- Guidelines for the control of run-off from C&D operations and preventing further contamination.

As with biosecurity issues, some of these lessons learned may require additional research before new guidelines can be developed. For example, research is needed on how to destroy virus in large quantities of infected milk. Another topic for further study is clarification of the respective environmental regulations for C&D methods. One animal health official noted a need for research to determine concentrations, contact times, surface variability factors, and shelf life for commonly used viracides and disinfectants. Results and recommendations from these studies should be included in relevant response plans, including those for agencies that handle response to hazardous materials.

Decontamination procedures for animals, exposed persons, and machinery following release of an FAD agent were rarely mentioned as a separate issue from C&D, even though many exercise reports concerned terrorism-related scenarios.

Disposal

Issues related to carcass disposal arose in reports from both real-world events and exercises, and from a wide range of diseases including FMD, BSE, Rinderpest, AI, monkeypox, and fictional livestock diseases. Concerns about carcass and product disposal were mentioned in the after-action reports perhaps more than any other SOP-related

topic, and across a wider variety of events, diseases, and affected species. This suggests that disposal issues present a notable obstacle to field responders, and any effort to resolve these concerns beforehand could improve response effectiveness.

Mostly, these lessons regarding disposal fell into three groups, which included the needs for:

- More information regarding legally and environmentally acceptable practices, and establishing agreements beforehand with the relevant parties to carry out those practices.
- Better understanding of the step-by-step methods and equipment that would be used.
- Guidelines and protocols for the disposal of potentially infected products (milk, eggs, etc.) as well as animal carcasses.

Successful disposal practices were noted in after-action reports from the 2003 AI outbreak in British Columbia and the 2002 AI outbreak in Virginia. These included:

- Having FAD eradication plans in place, and having them tailored with specific information regarding disposal volumes.
- Using novel composting procedures that proved to be effective.
- Using large landfills for disposal, since this was both an economical and publicly acceptable option.
- Establishing biosecurity measures for the transport of dead birds, which prevented further spread of the virus to other geographic areas.

One lesson that stands out is CFIA's success with including specific information regarding disposal practices in FAD eradication plans. Further, Canadian responders suggested revising those plans to include new composting procedures that were used during the AI outbreak. The need for better disposal plans and protocols is consistently mentioned in reports from U.S. events. While differences among State authorities and environmental regulations may make it more difficult to develop overall guidelines, there is still much ground to be gained by working out some of these issues before an outbreak occurs.

All of the after-action reports that included lessons learned regarding disposal mentioned the need for better understanding of disposal options. Responders noted a need for plans and guidelines regarding how to dispose of animal carcasses and products, and for pre-arranged agreements to do so. One exercise report included a list of contingencies that should be included in plans for carcass disposal [5]:

- Different animal species to be disposed of
- Numbers to be disposed of
- Environmental considerations for selecting a disposal site
- Seasonal considerations, and
- Preparatory disposal requirements.

In addition, we suggest including consideration of potentially infected products, and whether those products should be recalled, disposed of, and/or routed to alternative uses. Preparatory disposal requirements could include a list of equipment that should be obtained (panels, liners for disposal pits, fuel for incinerators) for different disposal methods, and requirements for handling the products.

Other lessons involved regulatory actions to address disposal needs. One exercise report suggested that the State environmental agency consider imposing a requirement to identify and secure a pre-approved disposal location (either on- or off-site) for each new feedlot before a permit is issued. Another report suggested examining whether some environmental regulations could be relaxed when a State declaration of emergency is issued. Yet another suggested incorporating cost analyses that would include indemnity for land values. Reports also noted the potential effects that different disposal options would have on international trade.

While mass disposal concerns arose most often in reports regarding AI and FMD, the need to handle disposal very quickly was noted in reports regarding monkeypox and Rinderpest. Though each disease and species presents different challenges for mass disposal of carcasses and products, a set of general guidelines for the disposal options listed above and pre-determined planning factors would prove useful for local responders.

Epidemiology

Lessons learned related to epidemiology were mentioned in reports from real-world events involving monkeypox, BSE, AI, and END, and from exercises involving FMD, Rinderpest, AI and fictional livestock diseases. Overall, the task of conducting trace-outs from infected premises was considered overwhelming and a desire to have more epidemiology-trained responders was consistently noted. Barriers to shared reporting of disease cases, especially during a zoonotic disease outbreak, were also discussed. In addition, questions also arose about how to define the end of an epidemiology investigation.

Reports from FAD outbreaks noted a number of successes regarding epidemiology and trace-outs, including:

- The ability of the State veterinary diagnostic laboratory to quickly and accurately test surveillance samples.
- Rapid trace-back and trace-out of animals, and rapid identification of the etiology and source of infection.
- Use of negative data from routine disease surveillance to assist with trace-out during an FAD incident.
- Decisive moves to stop trafficking of potential disease-carrying animals.
- Collection of suspect free-roaming animals, to reduce the risk to wildlife.
- The availability of an existing surveillance plan that was developed by an industry group.
- Cooperation of commercial and non-commercial operation managers and owners in surveillance testing.
- Aggressive response of the local industry to increase surveillance testing during an outbreak.
- Effective sample collection, euthanasia, and disposal methods that did not contribute to further spread of disease.

- Use of a graphic showing daily epidemiology updates, to provide responders with a quick look at the current status of the investigation.

As we discussed in the incident management section, the after-action reports frequently suggested having a common data set between local, State, and Federal animal health, as well as public health, authorities in the event of a zoonotic disease outbreak. Information on both human and animal disease cases would be needed by both sides of the response in order to understand the unfolding situation. However, carrying this out can be quite tricky due to information-sharing restrictions (such as for patient or producer confidentiality) between different government agencies and between different levels of government. Development of, or at least recommendations for, MOUs and non-disclosure agreements to share such data would reduce some of these barriers during an incident.

Other reports questioned how to determine when an animal is truly untraceable, how to report that finding, and how to know when to end an epidemiology investigation. Answers to these questions will likely depend on the FAD that is involved and how contagious it is, but leadership officials should be aware of the need to plan for the "end stage" of a response and to provide a scientific rationale for ending the investigation. They also must know what resources are available to conduct that analysis of when surveillance is complete.

Euthanasia

Lessons learned regarding euthanasia and depopulation of animals arose in reports from FMD exercises, and from BSE and AI outbreaks. The issues arose across different levels—from the field responders working on a euthanasia team to high-level officials deciding on depopulation policies. In contrast to the observations about carcass disposal, which mostly concerned methods and tactics, the lessons learned regarding euthanasia focused on policy needs. One explanation of this difference is that while responders will agree that carcasses need to be disposed of quickly, officials may debate when or which animals should be euthanized. In particular, policies for depopulation need to consider trade requirements.

In the Panhandle Exercise report, industry representatives recommended three criteria for the decision to depopulate a herd [8]:

- Confirmed diagnosis of an FAD
- Official statement, such as an agreement or declaration, regarding the use of depopulation as a disease control measure, and
- Indemnity funds and formulas to use them in place.

Other policy issues regarding depopulation were noted in the Tripartite exercise reports. In these events, officials in different States and/or different countries set depopulation zones of varying sizes. Unresolved questions concerned whether a neighboring State/country was obligated in any way to enforce zones established by another, and whether differences in depopulation zones should be reconciled. In addition, a couple of after-action reports suggested that officials need to understand that although they may have ordered the "immediate" slaughter of a group of animals, carrying out that action takes time.

Several points regarding successful euthanasia and depopulation practices arose from the 2003 BSE response in British Columbia and the 2002 AI outbreak in Virginia. These included:

- Setting up teams to handle the large number of personnel that were involved.
- Having cooperation with stakeholders and from outside agencies
- Keeping good documentation.
- Delineating staff duties and using specialists.
- Having a procurement officer on-site.
- Establishing an on-site command center that is located away from the inspectors.
- Using euthanasia methods that minimized the risk of further spread of the virus.

Suggestions for euthanasia operations included having more space to carry out the operations, more material and administrative support in the early stages, and more telephone capacity on-site [10]. Euthanasia teams also need time away from the response operations.

FMD Vaccination

Lessons learned regarding vaccination were mentioned exclusively in the reports from FMD exercises. These included the 2003-05 Tripartite exercise series (Amistad, MayDay, and Equinox exercises) and the 2004 Operation Aphtosa exercise sponsored by the California Department of Food and Agriculture.[4] Reports from the Tripartite exercise series are reviewed by the Emergency Management Working Group (EMWG), which is part of the North American Animal Health Committee. In turn, the EMWG determines action-items to be addressed at the next Committee meeting.

As a result of this ongoing process, many of the recommendations from earlier exercises (especially from Amistad and MayDay) have already been addressed. In the case of the MayDay exercise, changes to the North American Foot and Mouth Disease Vaccine Bank (NAFMDVB) program were made the same day that the exercise took place. This use of exercises to improve cooperation and preparedness for FMD outbreaks in North America has been successful at accomplishing the following:

- Revising protocols to activate the NAFMDVB once an FMD case is confirmed in North America, whether or not any of the participating countries has decided to use vaccine in its control strategy.
- Specifying the inputs and roles of the EMWG and the NAFMDVB Technical Committee to support the Commissioners of the North American Animal Health Committee.
- Including the option to deliver shipments of FMD vaccine directly from the manufacturer to the site of the outbreak.
- Considering alternate sources of vaccine.

4. All of these exercises were facilitated and analyzed by CNAC.

- Refining definitions of presumptive and confirmed FMD cases and the resulting communications protocols between the three countries.
- Coordinating with DHS regarding respective roles during vaccine bank activation and vaccine antigens.
- Identifying items needed for mass vaccination that could be included in the National Veterinary Stockpile.

While some of these efforts are ongoing, such as development of the National Veterinary Stockpile, the lessons learned from after-action reports have already been included in the planning. This overall progress in addressing recommendations from after-action reports is a best practice that should be continued, and should even be viewed as a model to improve preparedness for other FADs.

However, USDA-APHIS needs to provide more education about the NAFMDVB to State animal health agencies. The Amistad, Equinox, and Operation Aphtosa exercises identified a general lack of understanding among State and local responders regarding their roles in the process of FMD vaccination. At first, many of these responders thought that vaccine would be available more quickly and in much larger quantities at the outset than is the case. These misunderstandings affected their response plans and initial approach to the exercise scenario. Through the course of training provided by the exercises, a number of lessons were identified for state and local planning regarding FMD vaccination. These include the following:

- Determine who can vaccinate and whether additional veterinarians or other animal health professionals can be brought in to assist. This may depend on State regulations.
- Make plans ahead of time for how to recruit additional veterinarians to vaccinate livestock.
- Form a Vaccine Advisory Group that can provide local expertise about how best to apply a limited number of doses, how to track the vaccinated animals, and how to inform stakeholders of the vaccine strategy.

- Develop plans for transporting vaccine from the point of its arrival in the United States to the locations where it will be used, and for storing it there.

A number of other FMD exercise reports mentioned vaccine-related issues briefly, but did not provide lessons learned or recommendations. Particularly, exercises sponsored by DHS do not seem to adequately address these issues with local responders. Current efforts by USDA-APHIS to become more informed and involved in DHS exercise planning may help local and State responders better prepare for their roles in FMD vaccination.

Laboratory support

Lessons learned regarding laboratory support during response operations were mentioned in after-action reports from a variety of events, including AI, BSE, monkeypox, FMD, and END responses. The reports noted a number of successful practices from real-world events, and provided recommendations for further refinements. One concern that stands out is the need for field-level decision-makers to have timely and accurate access to laboratory test results, because those results will affect their day-to-day planning and operations. Laboratory results are often reported to higher-level officials first, and there may be a delay before those results are transmitted to the field. Concerns about transport times for samples taken from rural locations or from outside the continental United States were also noted.

Having a laboratory network that can provide surge capacity, share responsibilities, and be available for technical consultation was noted as a reason for success in after-action reports from FAD outbreaks in the United States and Canada. Other helpful practices were rapid implementation of testing procedures during an outbreak, and having scientists work on-site periodically to provide instructions for sample collection, explain the testing and reporting process, and receive questions from the field responders.

Most of the recommendations for improvement of laboratory support to FAD response noted needs for:

- Developing tools to assist rapid implementation of testing, whether in the field or at the laboratory.

- Better communication of laboratory results in a timely and accurate manner, especially to field-level decision-makers.
- Better tracking and transport of samples between laboratories.

A recommendation from the 2002-03 END outbreak was to establish a laboratory liaison position at the ICP. This individual would work with local/regional laboratories that are assisting with the response, ensure that local/regional personnel have received the test results, and forward any pending laboratory results or related information after an ICP has closed. A laboratory liaison could also provide instructions to responders on the proper collection, handling, and transport of samples.

Public information

Several after-action reports noted that meeting public education needs for understanding the effects of an FAD outbreak, including economic issues, should be a priority. Resources for public education—including both private practitioners and the general public—should be allocated at the start of an outbreak. These resources might include translation services to produce multi-lingual materials. One successful practice was to reach ethnic communities by having local radio or TV personalities relay FAD response information, and relaying it in multiple languages.

The lessons learned regarding public information fell into several groups, which included the needs for:

- Using information strategies to educate the public about the disease, its potential effects (or lack of effects) on their personal health, and ways that they can help mitigate disease spread.
- Having a unified public affairs strategy in the event of an FAD that affects both humans and animals.
- Addressing specific local needs for information about the ongoing response operations.
- Refining operating procedures to better describe the roles of public information officers in response operations.

- Understanding the interdependent needs for information sharing with the general public and other government agencies.

In turn, public information officials need to understand the terminology involved in FAD outbreaks so that they can effectively communicate with responders, the public, and the media. One after-action report suggested that media personnel be included in preparedness planning and be represented on local emergency planning committees. This approach might mitigate some of the confusion that was noted in exercise after-action reports regarding who was in charge of press releases.

In the 2005 BSE case investigation, USDA and HHS developed a unified public affairs strategy, and all media inquiries were directed to USDA. Those questions that concerned public health were then forwarded on to HHS. This approach was later cited as an effective method of controlling the release of information to the public.

Other after-action reports noted that local media needs may be lower priority than national media outlets. A number of reports recommended ways to tailor information-sharing strategies for local populations. These included the following:

- Develop and distribute multilingual educational publications.
- Identify and implement a method for notifying Amish farmers, since they do not use electronic media and don't receive broadcast messages.
- Keep local stakeholders (e.g., cattle owners and truckers) informed and provide them with focused information on how to manage an FAD outbreak.
- Establish limits for media personnel, such as prohibiting their access to laboratories.

All States have unique populations that may require additional measures for relaying public information to all communities. Meeting the information needs of these groups may require adding new procedures to response plans.

In addition, response plans should promote two-way release of information that keeps both the public and the responding agencies informed. EOC personnel need to know what information is released to the media, so that they are aware of what the public is hearing. This lack of two-way communication for public information was noted as a problem during a couple of real-world events.

Quarantine and movement control

Rapid response to outbreaks of contagious diseases requires the ability to control movement of animals, animal products, and, often, humans and materiel, on and around infected premises. The ability to rapidly determine control zones, notify affected individuals and property owners, and implement and enforce the orders can be challenging because of the different legal requirements at each level of government and the variety and number of agencies involved in preparing and enforcing stop-movement and quarantine orders. Often, a combination of State and Federal laws provide the necessary authorities to control movement. These laws vary from State to State, and decision-makers are not always familiar with them.

Several after-action reports from AI outbreaks cited the States' ability to rapidly implement control procedures following the identification of an index flock as a key factor in response success. This suggests that a target capability for animal health emergency response is the knowledge of authorities and demonstrated ability to impose quarantine and movement restrictions during an FAD outbreak.

Several reports covering a number of diseases, including zoonotic and non-zoonotic FADs, noted the need to clarify terminology—in particular, the word "quarantine." Public health and animal health officials, as well as commercial producers and hobby farmers, reportedly had different understandings of the term. Stating the goal and specific meaning of stop-movement and quarantine orders from the onset of a response or exercise can reduce the confusion. These definitions should be attached to documents sent by animal health agencies to other groups, and any changes in the definitions should be noted.

Legal statutes require notification of stop-movement and quarantine orders. For large control zones, notification plans to inform the agriculture community, the public, and others of the stop-movement orders need to be in place. These need to adhere to legal requirements for service and be cleared by appropriate State authorities. During one exercise, responders determined that publishing the orders in widely circulated newspapers, in conjunction with providing quarantine orders to agriculture-related businesses and interest groups, met the legal requirement and would get the information out to a broad cross-section of the population [4]. Participants in another exercise determined that notification requirements of stop-movement were attainable only by holding an emergency meeting of State animal health officials who had the authority to develop and announce a new policy restricting animal movements from premises throughout the state.

Stop-movement and quarantine notification procedures should be in place prior to an outbreak and documentation of the notification requirements should be included in FAD response plans. Several lessons regarding quarantine focused directly on the types and content of plans or SOPs that should be prepared in advance of an outbreak. Reports cited the following recommendations:

- Plans should document the legal authority needed to impose movement control and quarantine orders, and provide operational mechanisms to implement the orders.
- Plans should account for the need to coordinate Federal and State control zones, to create consistency in the response.
- Plans are needed to control susceptible animals, non-susceptible animals, humans, and fomites.
- Plans should include mechanisms for staging or holding areas for animals already en route.
- To the extent possible, compliance agreements should be prepared in advance to specify conditions for moving, processing, and selling animals, animal products, and feed and fertilizer.

Participants in several exercises, with zoonotic and non-zoonotic disease scenarios, concluded that the State or local community did not have the resources to enforce quarantine orders. However, the issue was not documented in any of the real-world event reports we reviewed. Nonetheless, the resources for quarantine may well be strained when dealing with larger-scale incidents, such as a widespread and intentional outbreak of FMD. For further discussion and recommendations regarding resources to enforce quarantine, see the earlier discussion on coordination with law enforcement agencies.

Vector control

Only two after-action reports, both on RVF, concerned an FAD that is spread by a vector. One of those reports described an exercise scenario involving terrorist release of the agent into a livestock operation and the potential spread of disease to humans. One critical lesson learned was the need for a plan to mitigate spread of a presumed zoonotic disease outbreak before a causative agent is identified. Control of the actual vector (in this case, insects) was not a focus of the exercise. Lessons learned from other after-action reports discussed vector control in the context of limiting the spread of FMD or Rinderpest via fomites or wildlife. A need for wildlife surveillance was also noted in reports from AI outbreaks.

Some areas of vector control may require additional research before NAHEMS guidelines can be updated—an example is the role of wildlife and feral animals in disease transmission. Several after-action reports noted questions of whether, and how far, to depopulate wildlife. Assessing the extent to which it is possible to depopulate wildlife was also mentioned. If a disease became endemic in wildlife populations, the overall approach to the outbreak would change. To complicate this issue, data on wildlife populations and density are not readily available. In States where animal health regulations require an epidemiological link before a premises can be depopulated, control of wildlife populations might be additionally problematic. Overall, this area appears to be a gap in FAD preparedness. The after-action reports that we reviewed did not seem to adequately address the disease control strategies for vector-borne diseases.

Appendix E
Lessons learned about long-term investments

A number of lessons learned in the after-action reports were specific to areas of preparedness that require sustained investment in technology, training, and scientific research. In addition to being critical at the time an FAD outbreak arises, technology, training, and scientific research require investment prior to the outbreak. Although not exhaustive, recommendations given in the sections below may serve as a resource to further guide USDA-APHIS' emphasis on its evolving FAD emergency preparedness and response programs.

Technology

Lessons learned regarding technological needs arose from a wide range of reports—from county-level exercises, to Tripartite exercises, to real-world events. Improved technologies, such as new rapid diagnostic methodologies and web-based tools for reporting of laboratory results, were cited as contributors to success during real-world events. However, most of the lessons learned concerned a need to address connectivity limitations at the local/field level.

Though EMRS was still in development during the 2002 AI outbreak in Virginia, access to it was considered useful for the field responders. In contrast, later after-action reports noted obstacles to using EMRS: the system was too cumbersome to use without high-speed internet access, there were too few trained personnel, and there were often gaps between the system capabilities and needs of the current situation.

The likely occurrence of FAD outbreaks in rural (vs. urban) areas can magnify any technology gap. Local-level after-action reports—whether in a county exercise or a real-world event—repeatedly cited concerns over having access to adequate communications lines. This lesson was mentioned as recently as the 2005 BSE case investigation,

during which responders were unable to set up a network drive for sharing information between the ICP and other responders.

On the other hand, local-level after-action reports also mentioned a desire to have wireless personal data-recording tools to use in the field, and to be able to transmit this data back to a command post. It is unclear whether unavailability of high-speed internet access could limit the use of wireless, hand-held tools. However, it appears that if the technological infrastructure was in place, responders would find it helpful to also use wireless, hand-held tools for responding to outbreaks in rural areas. Portable computers might allow field personnel to interface directly with EMRS.

Technological interoperability between levels of government would improve interagency coordination. Specific interoperability problems include sharing or linking between USDA and State-level databases, perhaps through EMRS. Resource requests, as well as the documentation proving that they were filled, could be more easily transmitted to USDA or other funding agencies if joint systems of financial record-keeping were used. A tracking system for animal product movements that can be accessed by other systems during an animal health emergency was also recommended by responders.

Training

The lessons learned regarding training showed a qualitative shift over the reports from 2002 to 2005. After-action reports from exercises and events during 2002-2003 frequently noted that participants needed to know more about working within the ICS structure. The basic need for ICS training was cited less frequently in reports from more recent exercises and events. This suggests that the ICS experience gained through exercises, real-world events, and general emergency preparedness efforts proved to be helpful.

A number of after-action reports noted that county-level responders and non-traditional response organizations (such as animal control agencies and commodities groups) still need to become more familiar with ICS. This would help them work within the response structure that State and Federal agencies have established. As funding for

local-level training related to homeland security increases over the next few years, we expect that these recommendations will appear less frequently in after-action reports.

The after-action reports cited a number of specific training areas for response personnel (see table 6). While this is not an exhaustive list of FAD-related training needs, it may be helpful for USDA-APHIS to focus on the topics that were frequently mentioned in after-action reports.

Table 6. Training needs for FAD responders, as suggested in after-action reports

Response node	Training need	Target audience
In the field	Orientation for personnel who will be deployed for field operations	Federal personnel being sent to the field Private practitioners being "federalized"
	Biosecurity measures, including use of PPE	Industry personnel, including local farmers Private practitioners Agriculture extension agents
	Procedures for specimen collection and handling	Selected responders
	Policies and procedures for C&D	
	Understanding documentation related to the ownership and movement of livestock	
At the ICP or EOC	EOC procedures	Support personnel
	Methods for estimating and documenting costs associated with response operations	Administrative and finance personnel
	Preparation of situation reports	Support personnel
	How to use EMRS	Selected responders
	Supervisory training	Individuals who will be in supervisory roles during the response
	Epidemiology	Selected responders
	Handling and security of evidence in a criminal investigation	ICP/EOC leadership
Other locations	What to look for in animal health emergencies	Law enforcement officers
	Stop-movement orders and quarantines that might be ordered by agriculture officials	
	Identification, collection, and proper handling of evidence in FAD investigations	

The after-action reports also cited ways to provide training to FAD responders. These recommendations include:

- Establish a website to provide information about the disease and explain quarantine procedures.
- Develop a training video on C&D procedures.
- Give private practitioners copies of previous after-action reports, such as from the United Kingdom FMD outbreak.
- Invite several of the U.S. professionals who have assisted in outbreaks in other regions of the world to speak at professional gatherings of animal health personnel.
- Invite law enforcement representatives to training, exercises, and planning sessions regarding agriculture emergencies.
- Prepare a technical lexicon that explains the terms used by veterinary personnel.
- Have an overlap in personnel rotations from 1 day to 1 week, depending on the position, to allow for training of the new personnel.
- Mentor responders serving in lead ICP positions—for example, by having them work with experienced Forest Service personnel.
- Conduct periodic simulations and emergency exercises.
- Hold orientation and training activities related to plans and SOPs, in addition to exercises.

Again, this is not an exhaustive list of the methods that can be used to provide FAD-related training but it may help trainers consider how their training efforts can be enhanced.

Several reports suggested reaching out to other agencies that could help establish operational systems and tools to support the response efforts. For example, State agriculture officials could work with agencies that have more EOC experience to help them establish an operational rhythm, situation reports, action plans, standing watches, and other mechanisms that facilitate overall situational awareness. State and local governments should be encouraged to reach out to these agencies for management support during exercises and during actual responses.

Scientific research

Reports from a number of exercises and real-world events mentioned issues for further scientific research. In exercises, responders and decision-makers were sometimes unable to proceed without a better understanding of the scientific concerns behind one course of action or another. These lessons learned noted a need for additional research into the following areas:

- Economic trade-offs of euthanizing versus vaccinating herds, movement restrictions, and how those factors might be different in a terrorism event
- Survivability of a particular virus (e.g., Rinderpest or FMD) in different environmental conditions, in compost, or in products such as milk
- Potential for disease to spread among wildlife and feral animals, and how best to depopulate those animal populations if needed in order to control disease spread
- Development of environmentally friendly options for carcass disposal
- Risks that vehicle movements will spread the disease
- Usability of off-the-shelf vaccines (rather than emergency preparations that are called for in the NAFMDVB contract) during an FMD outbreak.

Most of these lessons arose from FMD exercises and responders questioned whether data from other countries would apply to North America. Overall, many observations noted a need for mathematical modeling to assist with decision-making during an FAD outbreak.

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